Vol. 38 No. 1

BULLETIN

OF THE

TORREY BOTANICAL CLUB

JANUARY, 1911

Further notes on the stemless violets of the South

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(WITH PLATE 1)

In the preceding paper* the *palmata* group of blue stemless violets was discussed. Next to these in Dr. Small's Flora of the Southeastern United States comes the *affinis* group, consisting of three closely allied species, growing in wet soil. They are characterized by glabrous foliage, and cleistogamous flowers on ascending peduncles that elongate and bear ellipsoid capsules, more or less tinged or dotted with purple.

VIOLA AFFINIS proves to be a widespread and somewhat variable species. The most marked variation is the pubescent capsule, seen in New England specimens only from Wellesley, Mass., but often in specimens from the Middle States, and collected as far south as Mt. Vernon, Va. This character appears in no other species of our stemless violets, though found in several of the stemmed violets: *V. pubescens*, *V. scabriuscula*, and *V. canadensis*. In all cases it is an inconstant character, being often absent in associated plants otherwise identical.

In the South I collected *Viola affinis* at Summerville, S. C., and found it abundant at Biltmore, N. C. From West Nashville, Tenn., Mr. W. W. Eggleston sent me live plants, that I place here, after growing them for two seasons; though they are somewhat larger than normal in leaf, capsule, and seed.

Specimens of VIOLA LANGLOISII Greene of eastern Louisiana and Texas are not easily distinguished from specimens of *V. affinis*

*37: 581–590. 11 Ja 1911.

[The BULLETIN for December, 1910 (37: 569–630. *pl. 36*) was issued 11 Ja 1911.]

of the North, if one does not know from which region they came. For five seasons the southern plant has been growing out of doors in Vermont, with no winter protection but a covering of leaves; and though not perfectly hardy, and not flowering freely in the spring, yet aside from an indefinable something in its general aspect, I can differentiate it from *V. affinis* by no better earmark than the much greater length of the auricles of the sepals.

However, the southern plant develops a variety with lobed leaves, such as is never found in connection with its northern relative. This in my recent distribution of the violets of eastern North America I have named: *Viola Langloisii* Greene, var. **pedatiloba**, var. nov. As in *V. esculenta*, the lobed leaves are preceded in early spring and followed in late summer by the ordinary uncut leaves.

VIOLA CHALCOSPERMA, the new species of this group from Florida, has the same heterophyllous character, and the same habitat—low tracts often flooded, along sluggish streams.

The third and last group of blue stemless violets in the South may be represented by *Viola cucullata* and *V. sagittata*, and consists of eight species. The group is marked by having subulate or sagittate cleistogamous flowers, on erect peduncles, their capsules always green; the leaves markedly cordate only in *V. cucullata*, usually sharply dentate toward the base or lobed. Two of these species differ from the rest in having the spurred petal glabrous and the lateral petal furnished with a strongly clavate beard. Neither of them is given in the manual of Dr. Small, though VIOLA CUCULLATA is not rare in the southern Alleghanies, and V. VIARUM Pollard is reported for Oklahoma. Mr. B. F. Bush, who sent me specimens from Eagle Rock, southern Missouri, reports that the species is very common along the rocky banks of the White River, which flows southeastwardly for over a hundred miles through the Ozark Hills of northern Arkansas.

Another pair of species—V. FIMBRIATULA and V. VILLOSA—differ from the other six in having a finely pubescent foliage. Both are plants of dry sandy soil. *V. fimbriatula* is rather a northern species, reaching southward along the Appalachian Mountains; while *V. villosa* is strictly southern, and affects the lower levels

of the coastal plains. However, to my great surprise, I found it at three stations, 50 or 100 miles apart, in Oklahoma and Arkansas; and in the Biltmore herbarium I noted a specimen that came from Lufkin, Texas, in 1903.

At Biltmore are also to be seen the aberrant forms of *V. fimbriatula*, on which Mr. Pollard based his *V. amorphophylla*.* The specimens were originally collected by members of the Biltmore staff, and came from Oak Mt., Tryon, N. C., near the Skyuka Hotel (alt. 760 m.)—the only known station. Through the kindness of Mr. C. D. Beadle, one of his assistants was allowed to guide me to the station—a trip of two hours by rail to Tryon, and a three hours drive up the mountain. With *V. amorphophylla* were found several familiar species: *V. cucullata*, *V. palmata*, and *V. fimbriatula*; also the two hybrids, *V. cucullata* × *fimbriatula* and *V. fimbriatula* × *palmata*. The *V. fimbriatula* was the somewhat peculiar form of the southern Alleghanies, having at the base of the leaf on either side one or two long slender teeth or auricles. Intermingled with these, and differing from them only in lack of pubescence, were many young plants of *V. amorphophylla*. The query at once arises, how did this anomalous form originate. Many analogous cases lead me to believe that it is a Mendelian derivative from *V. cucullata* × *fimbriatula*, with which it is still growing—inheriting the leaf form of the one parent species and the glabrous character of the other. In confirmation of this view I would state that at this station were found several plants that had the leaf form of *V. cucullata* × *fimbriatula*, but were unlike it in being perfectly glabrous—another derivative, still hybrid in part. Such a plant may be conveniently called a subhybrid; while a plant like *V. amorphophylla*, wholly rid of the hybridity in its parentage, may be called an ex-hybrid. *V. cucullata* × *fimbriatula* is frequently found in the North, appearing in two forms, according as the parent *V. fimbriatula* has the leaves at the base coarsely toothed or merely crenate-serrate. From a hybrid of the latter form I raised in 1908, and have still in the garden, nine offspring reverting variously, as respects the several pairs of opposed characters found in the grandparents, sometimes to one of them and sometimes to the other, and sometimes to the

*Proc. Biol. Soc. Wash. 13: 129. 1900; Small, Flora of Southeastern U. S. 802.

mother hybrid. Among these nine offspring are two as glabrous as the plant of Mr. Pollard. It is hoped that seeds of the Oak Mt. plants recently sown will another season throw still further light on the status of *V. amorphophylla*.

Viola sagittata and *V. emarginata* constitute another pair of closely allied species; indeed, the latter was originally proposed by Nuttall as a variety of the former. *V. emarginata* grows in much drier soil, and matures wider leaves. It occurs frequently in open woods near Eutaw Springs and Columbia, S. C., and in groves of oak on hillsides at Tryon, N. C.; also abundantly on low hills in the vicinity of Muskogee, Okla. The notched petals that Nuttall observed in the type, and that suggested the name, are rarely found in the plants of the South and West.

Viola sagittata is found through a remarkably wide range—from eastern Massachusetts to southern Louisiana. It is also noteworthy for its inconstancy as respects pubescence. It seems to be normally glabrous; but forms with slight or marked pubescence, like that of *V. fimbriatula*, occur in certain districts of the East, and prevail in the region of the Great Lakes. When these two species grow together, they are generally confluent, not only as regards pubescence, but in length of petiole, in width of leaf, and in sagittate incision at base.* The general situation seems to present a marked instance of an interchange of characters in two allied species through hybridism, continued perhaps from a remote past.†

Viola dentata Pursh has found a place in the Britton Manual as the older name of *V. Porteriana* Pollard,‡ an anomalous plant of not infrequent occurrence in the northern and middle Atlantic States. This in 1904 I interpreted as *V. cucullata* × *fimbriatula*,§ the plant discussed above in connection with *V. amorphophylla*. The identification by Professor Greene of this plant with *Viola dentata* Pursh is based mainly upon its being "quite the same" as an unpublished colored drawing of LeConte's, labeled *V.*

*"Where the two species [*V. fimbriatula* and *V. sagittata*] grow together it is difficult to find the pure species unmixed." Philip Dowell, Bull. Torrey Club **37**: 175. 29 Ap 1910.

†See Rhodora **8**: 57. *pl. 68*. 27 Mr 1906; and Am. Nat. **44**: 233. Ap 1910.

‡Bull. Torrey Club **24**: 404. *pl. 314*. 1897.

§Rhodora **6**: 217. 30 N 1904.

emarginata—a plant that LeConte in his paper on *Viola* considers equivalent to *V. dentata* Pursh.* Having seen this beautiful drawing, through the kindness of Professor Greene, I am convinced that it does represent the *V. Porteriana* of Pollard; but equally confident that it is not the *V. dentata* of Pursh. In other words, LeConte confused three distinct things: *V. sagittata*, var. *emarginata* Nuttall, *V. dentata* Pursh, and a hybrid of *V. cucullata* with *V. fimbriatula*. But the error of LeConte was due in part to the earlier errors of Pursh. This pioneer of North American botany knew plants in the field better than in the printed pages of European authors. It is generally acknowledged that his *Viola primulifolia*—"pubescent, flowers blue, sepals ciliate, on dry hills; Canada to Virginia"—is *V. fimbriatula*, the form with uncut basal lobes; and one who reads carefully his descriptions will, I think, be further convinced that his *Viola sagittata*—"*pubescent*, leaves incised at the base, peduncles *longer* than the leaves: on *dry* hills; New England to Virginia"—is also *V. fimbriatula*, the form with coarsely toothed basal lobes; and that his *Viola dentata*—"*glabrous*, leaves subhastately large-toothed below, peduncles *shorter* than the leaves; in *wet* meadows and woods; Pennsylvania"—is simply *V. sagittata* Aiton. Having misapplied the name *V. sagittata*, Pursh had to coin a new name for the plant of Aiton.†

VIOLA SEPTEMLOBA LeConte is very abundant in the pine barrens of the coastal plains from South Carolina to Mississippi; it was well described by its author 85 years ago, and for 25 years found a place in Eaton's Botany, the most widely used manual of that period. Yet subsequently for half a century it suffered a well-nigh total eclipse; until in 1903 it reappeared to the scientific world in Mr. Pollard's account of the southern violets in Dr. Small's manual. It has been often confused with *V. Brittoniana*, a cut-leaved species of the same group and of similar habitat. But they differ strikingly in at least two respects: (1) The seeds of *V. Brittoniana* are buff and 1.6 mm. long; those of *V. septemloba* are dark brown and 2 mm. long. On weighing 200 seeds of

*Pittonia 3: 256; Bot. Gaz. 26: 340. 1898.

†The full diagnosis of *Viola dentata* Pursh is: "V. glabra; foliis oblongis acutis basi truncatis serratis inferne subhastato grandi-dentatis, pedunculis foliis brevioribus, calycis laciniis linearibus, petalis 3. inferioribus basi barbatis." Fl. Am. Sept. 1: 172. 1814.

each, those of *V. septemloba* were found to be 93 per cent. the heavier, or nearly twice as large.* (2) The leaves of *V. Brittoniana* are palmately parted, *all* of the three primary segments being again twice or thrice split; those of *V. septemloba* are pedately parted, the ultimate lobe at the base often runcinately pointed downward. See PLATE 1, FIGURES 3 and 8.†

In accordance with a general rule discussed in the preceding paper, the leaves of *V. septemloba* are also heterophyllous. The older leaves on most plants when in flower are uncut, some of them plainly survivors of an autumn growth. Not infrequently vigorous plants with *all* the leaves uncut are found growing intermingled with normal plants. Specimens of these separated out might easily pass for a different species. Indeed, an intermediate form of *V. septemloba*, with leaves irregularly 3–5-lobed, was published as *V. insignis* by Mr. Pollard in 1898.‡ Because of an earlier use of this name, Professor Greene renamed the plant *V. vicinalis*, recognizing that it was "manifestly related to *V. septemloba*."§

But I find this 3-lobed form constantly associated with the typical form. In scores of large colonies along the Atlantic and Gulf coasts I have found some plants with all the leaves uncut, and some with all the leaves 3-lobed; and sometimes these two leaf forms and the usual 7-lobed leaf occur on the same plant. It seems to me, therefore, that *V. insignis* hardly merits even varietal rank.

VIOLA PEDATIFIDA G. Don is entitled to a place in Dr. Small's Flora, as it occurs not infrequently on the prairies of western Oklahoma. Of all our cut-leaved violets this has a leaf the most pronouncedly multifid; and the cutting is rather on the palmate than on the pedate order, though the name implies the contrary.

*These two measurements are in close agreement. If we assume that both kinds of seeds have the same form and density, their length having the ratio 2/1.6, their volumes will have the ratio $(2/1.6)^3 = 1.95 +$, making the seeds of *V. septemloba* 95 per cent. the larger.

†Le Conte says of his *V. septemloba*: "It is far more worthy of the name *pedata* than the species to which that name has been applied by general consent." Annals N. Y. Lyceum 2: 141. 1826.—The primary segments of *V. pedata* are further cleft or incised in a *palmate* fashion. See PLATE 1, FIGURE 6.

‡Bot. Gaz. **26**: 334, with a good figure.

§Pittonia 4: 9. Ja 1899.

The leaf is primarily three-parted, and when well developed each of the three segments is further trisected, and then each of these subdivisions once more cut into 2–4 lobes. (See PLATE 1, FIGURE 2.) In the smaller leaves and in those that appear in summer the lateral primary segments are often imperfectly or obscurely trisected and seem to be somewhat irregularly pedate; and this fact doubtless suggested the inappropriate name of the species. In *V. pedatifida* the middle segment is never uncut, as in leaves strictly pedate, but is even more dissected than the lateral segments.

Synopsis of cucullata-sagittata group of blue stemless violets

Spurred petal glabrous, lateral with clavate beard.	
Leaves uncut, broadly cordate-ovate.	*V. cucullata.*
Leaves pedately lobed or parted.	*V. viarum.*
Spurred petal villous at base, lateral with capillary beard.	
Foliage finely pubescent.	
Leaves ovate-oblong, acute.	*V. fimbriatula.*
Leaves ovate to orbicular, obtuse.	*V. villosa.*
Leaves oblong-lanceolate, incised at base.	*V. sagittata.*
Foliage nearly or quite glabrous.	
Leaves oblong-lanceolate, incised at base.	*V. sagittata.*
Leaves deltoid to broadly ovate, coarsely toothed at base.	*V. emarginata.*
Leaves uncut or pedately 3–9-lobed.	*V. septemloba.*
Leaves palmately cut into 9–30 lobes.	*V. pedatifida.*

All the species of white stemless violets found in the North, except *Viola renifolia*, are found also in the territory embraced in Dr. Small's Flora; and in addition one not found in the North, *V. vittata* Greene. But only two of the northern species, *V. lanceolata* and *V. primulifolia*, are widely distributed in the South —*V. pallens*, *V. blanda*, and *V. incognita* being restricted there to the upland region of the southern Alleghanies.

In this group pubescence proves to be an inconstant character. VIOLA PRIMULIFOLIA, which in the extreme North is quite glabrous, becomes more and more pubescent as we go southward, untili n the Gulf States it is often densely villous on the petiole and lower leaf surface. This variety was first noted by LeConte, and named var. *villosa* by Amos Eaton, when he adopted in his Manual LeConte's treatment of the genus. Mr. Pollard's var. *australis* seems to cover the same ground.

VIOLA VITTATA Greene (*V. denticulosa* Pollard), an odd species with long linear leaves, is at times almost glabrous, and seems

to have been so in the type specimens, as the author makes no mention of any pubescence. But usually more or less hairiness appears on the petioles and lower leaf surfaces, and they are sometimes densely villous.

VIOLA BLANDA Willd. is glabrous except for scattered white hairs on the upper surface of leaves that unfold at flowering. But in Tryon, N. C., I found a colony without a trace of white hairs; and plants transferred to the garden, and their offspring, have continued perfectly glabrous.

The type of VIOLA RENIFOLIA Gray is markedly pubescent throughout; but the more common form has at least the upper leaf surface glabrous, and has been published as a species, *V. Brainerdii*, by Professor Greene.* But the difference between the two plants, though perhaps worth naming, is not specific, according to my conception of species.

VIOLA INCOGNITA Brainerd is also inconstant as respects pubescence. The type has "peduncles, petioles and lower surface of leaves pubescent with soft white hairs especially when young, the upper leaf surface glabrous or nearly so."† But in low moist woods nearly glabrous forms are frequent, usually with minute white hairs on the upper surface of the later leaves, as in *V. blanda*. Though in all other characters these two forms are identical, yet I find their marked difference in pubescence has been a source of confusion to students of *Viola*: and I would therefore distinctly mark off this form, as

Viola incognita, var. **Forbesii**, var. nov. Nearly or quite glabrous, except often for scattered white hairs on the upper leaf surface; otherwise like the type. A common form in moist woodlands, from eastern Quebec westward to Wisconsin, and southward to the mountains of eastern Tennessee.

All forms of *V. incognita*, except certain hybrids, differ from *V. blanda* Willd. in having at maturity broader leaves with deeper and wider sinus at the base, in having the lateral petals bearded, the upper petals obovate and not porrect, and in flowering a week or two earlier. But the most marked difference appears in the seeds, which in *V. incognita* are obtuse at base, brown, smooth,

*Pittonia 5: 89. 1902.

†Rhodora 7: 248. 31 D 1905.

EIGHT CUT-LEAVED SPECIES OF VIOLA, 1–4, palmate; 5–8, pedate.

2 mm. long; and in *V. blanda* acute at base, dark brown, minutely rugose, 1.5 mm. long. The accompanying figure is given to bring out these differences, and incidentally to illustrate the diagnostic value of seed characters in *Viola*.

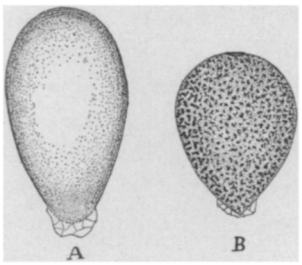

FIGURE 1. *A*, a seed of Viola incognita; *B*, a seed of Viola blanda; × 15.

MIDDLEBURY, VERMONT

Explanation of plate I

All the figures × ⅔

1. *Viola palmata* L. Lake Co., Fla.	Palmately cut.
2. *V. pedatifida* G. Don. Muskogee, Okla.	
3. *V. Brittoniana* Pollard. Dedham, Mass.	
4. *V. Egglestonii* Brainerd. West Nashville, Tenn.	
5. *V. triloba* var. *dilatata* (Ell.) Brainerd. Mansfield, La.	Pedately cut.
6. *V. pedata* L. Terra Cotta, D. C.	
7. *V. esculenta* Ell. Jacksonville, Fla.	
8. *V. septemloba* LeConte. DeLand, Fla.	